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Mr. Johnson not only responds to the challenge posed by Dr. Berkner, but poses a new challenge as well — a challenge to technology. The author first explores the law's response to the challenge of space communications technology, and finds, through INTELSAT, the Space Act of 1958, and Satellite Act of 1962, that the law has not only responded but has also stimulated the growth of technology. The sphere of international law and relations is the key to providing the atmosphere necessary for technological advances, and, at least in global communications, the cooperation has been remarkable. From this example, Mr. Johnson generalizes his conclusion that the law must lead as well as respond, must provide a framework into which technology can expand, and must challenge technology to the most rapid possible achievement.

IF I HAVE any thesis to advance today, it is that the relationship of law to technology involves far more than the law merely responding, in a more or less belated fashion, to the rushing advance of technology. Rather, if law is used creatively, this relationship should involve a mutual stimulation, a mutual challenge and response. The scientists, the engineers, and the lawyers must walk hand in hand into the future, each stimulating the other to maximum creativity.

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Dr. Berkner, speaking on behalf of technology, has presented such a host of challenges that the lawyer may be excused for feeling somewhat overwhelmed at the tasks which lie ahead. However, since he has singled out space technology as a particularly pertinent example, I thought it might be useful to supplement his presentation by considering the recent history of the law's response to the technological advancement which has taken place as the result of harnessing in a united development effort two of our most rapidly evolving technologies: space and telecommunications. Perhaps our consideration of this particular response will encourage us to believe that the law will continue to rise to the challenges of the future.

What I have to say will not be on the level of morality and

philosophy which Dr. Berkner has introduced to us; rather, I will deal with the practical mechanisms which it is the business of the law and the lawyer to devise on a day-to-day basis.

Dr. Berkner has referred to the "promise of a magnificent, economic, and profitable space industry that can now be foreseen." The prospect is truly magnificent; in fact, it is already a reality in the field of space communications.

It was less than a decade ago that outer space was first penetrated by manmade vehicles. For the first time man was able to place mechanisms of considerable size far above the earth's atmosphere, to control their positioning and movement with amazing precision, and to utilize them to serve his scientific and economic interests. These technological breakthroughs made it possible for a satellite such as Early Bird, the first commercial communications satellite, to hover over the earth, bridging the oceans, the deserts, and the jungles, and enabled man to reach into the most distant parts of the globe to communicate with other men by means of speech and the projection of visual images.

The past 2 years have seen the first successful commercial utilization of outer space by means of the communications satellites of the International Telecommunications Satellite Consortium (INTELSAT). Since June of 1965, Early Bird, the first of INTELSAT's satellites, has been in daily service over the Atlantic, linking North America and Western Europe through the medium of an electronic jewel poised in outer space some 22,300 miles above the equator. INTELSAT now has two more satellites in continuous commercial use, one over the Pacific, launched in January of 1967, and another over the Atlantic, launched in March of 1967.

Today, when one makes an international telephone call from North America to Europe or to Japan, there is a very good chance that it will be routed via satellite. And, of course, the use of the INTELSAT satellites for television transmission across both the Atlantic and Pacific Oceans has projected their influence into millions of households spread more than halfway around the world.

This rate of progress in the large-scale utilization of a new technology for the economic benefit of mankind is without parallel in previous experience. When we compare the long years that elapsed between the Wright brothers' first flight and the development of commercial aviation with the brief span of time between the orbiting of the first spacecraft in 1957 and the achievement of a global

system of communication by satellite, it is evident that one of the most striking aspects of this new technology is the speed with which its potentialities for practical benefits are being realized.

This achievement has involved not only the mastery of complex technical problems by our scientists and engineers, but also the creation of new legal structures, both domestically and internationally. Indeed, I think it safe to say that the rapidity of commercial development in the field of space communications is due to the fact that the law's response has, in this case, been synchronized to an unprecedented degree with the pace of advancing technology. Legal developments in the form of statutes, corporate organization, international agreements, and the creation of a new worldwide organization have been in step with each phase of technological advancement.

On the domestic scene, two historic statutes have been enacted by the Congress of the United States: The National Aeronautics and Space Act of 1958,[1] and the Communications Satellite Act of 1962.[2] In the international field, 56 countries are now parties to international agreements which created a new international organization, INTELSAT,[3] for the purpose of sharing the costs and the benefits of satellite communications on a global basis. Each of these actions represents the timely response of the law to a new technological challenge.

From the legal standpoint, one might mark the United States' entrance into the space age from the date when President Eisenhower signed into law the National Aeronautics and Space Act of 1958 on July 29 of that year. That Act created a new civilian agency of government, the National Aeronautics and Space Administration (NASA), and gave it a responsibility radically different from anything that had gone before, namely, to "plan, direct, and conduct aeronautical and space activities."[4]

One of the provisions of the 1958 Act authorized NASA "to cooperate with other public and private agencies and instrumentalities in the use of services, equipment, and facilities."[5] Acting under this legal grant of authority, NASA in the spring of 1961

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[1] 42 U.S.C. §§ 2451-76 (1964).

[2] 47 U.S.C. §§ 701-44 (1964).

[3] Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System, Aug. 20, 1961, [1964] 2 U.S.T. 1705, T.I.A.S. No. 5646; Special Agreement, Aug. 20, 1961, [1964] 2 U.S.T. 1745, T.I.A.S. No. 5646.

[4] 42 U.S.C. § 2473(a)(1) (1964).

[5] *Id.* § 2473(a)(6).

entered into a cooperative agreement with the American Telephone and Telegraph Company under which NASA undertook to launch a communications satellite (Telstar) developed by AT&T at its own expense, with the American Telephone and Telegraph Company reimbursing NASA for the costs directly incurred in such launching.

As you know, this particular government-industry partnership effort was highly successful. Telstar was followed by other experimental communications satellites launched by NASA, including the successful launching in 1963 of the Syncom satellite, so named because its period of orbital rotation is synchronous with the rotation of the earth, so that instead of rising and setting over the horizon it appears to be fixed in a stationary position in the sky, 22,300 miles above the equator. Three such satellites, properly positioned at approximately equal distances around the globe, can provide communications coverage for almost the entire surface of the earth.

The lawyers and legislators were not idle while these developments were taking place. Well before the first Telstar satellite was launched, bills were introduced in Congress providing for the creation of a new corporate entity which would be the United States participant in a global system of satellite communications. After lengthy debate in the summer of 1962, Congress passed and President Kennedy signed into law the Communications Satellite Act of 1962.

The 1962 Act is noteworthy not only for its legal innovations but also for its timing. It articulated a national policy and produced the legal means for reaping practical benefits from a new technology almost as soon as the first experimental communications satellite had been sent aloft.

In the 1962 Act Congress declared "that it is the policy of the United States to establish, in conjunction and in cooperation with other countries, as expeditiously as practicable a commercial communications satellite system, as part of an improved global communications network, which will be responsive to public needs and national objectives, which will serve the communication needs of the United States and other countries, and which will contribute to world peace and understanding."[6]

The Act's declaration of policy then goes on to state: "In order to facilitate this development and to provide for the widest possible participation by private enterprise, United States participa-

[6] Communications Satellite Act of 1962, 47 U.S.C. § 701(a) (1964).

tion in the global system shall be in the form of a private corporation, subject to appropriate governmental regulation."[7]

This is the origin of the Communications Satellite Corporation (COMSAT). Although by law it is a corporation organized for profit and is not an agency of the United States Government, it is nevertheless the sole authorized participant on behalf of the United States in a worldwide communications satellite system.

While the 1962 Act called for the establishment of a global communications satellite system "as expeditiously as practicable," it did not attempt to prescribe the nature of the international arrangements which should bring the system into being. This was left to be worked out through negotiations with our foreign partners.

Negotiations which were conducted during 1964 between the countries of Western Europe, Canada, Australia, Japan, and the United States culminated in the conclusion of two interrelated agreements which were opened for signature in Washington on August 20, 1964. On that date they were signed by 14 countries. Today, a total of 56 countries are parties to these agreements.

A fundamental principle of the agreements is that the satellite portion of the global system should be owned and financed on the widest possible international basis, and that the extent of each participant's financial investment and ownership share in the satellites should be related as closely as possible to its potential use of the system. The earth stations, on the other hand, which are used to transmit telecommunications traffic to and receive it from the satellites, are separately owned and financed by private or public instrumentalities in each of the countries in which they are located.

On the basis of this principle — namely, joint ownership and financing of the satellites and separate ownership of the earth stations — the agreements which were negotiated in 1964 established INTELSAT, the International Telecommunications Satellite Consortium. By these agreements, each of the 56 governments participates in the financing, ownership, and operation of the satellite portion of the global system either directly or through a public or private communications entity designated by it. In accordance with the Communications Satellite Act of 1962, the Government of the United States has designated the Communications Satellite Corporation as its participant in INTELSAT. COMSAT has also been designated by the INTELSAT agreements as the Consortium's manager.

[7] *Id.* § 701(c) (1964).

The satellite portion of the system is owned by all of the parties in undivided shares in proportion to their respective contributions to the costs of the development, production, and launching of the satellites. The Communications Satellite Corporation, as the United States participant in this venture, was initially obligated by the agreements to contribute 61 percent of the capital required for the establishment of the space segment. As additional countries have become parties, the quotas of previous signatories have been reduced pro rata to accommodate the quotas of all parties within the total of 100 percent. COMSAT's quota is now about 53.8 percent. A majority of the countries have quotas of less than 1 percent.

On the organizational side, the agreements established a governing body for the Consortium, the Interim Communications Satellite Committee. With a view to holding that body to a manageable size, it was decided to limit membership on the Committee to representatives from each of the members or groups of members of the Consortium having an ownership interest and a financial commitment of 1.5 percent or more. Each member of the Committee has voting power in proportion to the ownership share of the organization or organizations he represents. The Committee now has 17 members, representing 40 of the 56 members of INTELSAT.

I referred earlier to the fact that two interrelated agreements were negotiated in 1964. The first of these is an agreement among governments establishing certain basic principles and goals to which all of the countries signing the agreement are committed, as well as establishing the structural framework of the organization. This agreement states the goal of creating a single global commercial communications satellite system at the earliest practicable date, and it expresses the desire that all nations should be permitted to use the system on a nondiscriminatory basis.

The second agreement, called the Special Agreement, prescribes the particular functions and duties of the Interim Committee and of the manager of INTELSAT. It deals mainly with the financial and operational aspects of INTELSAT, including such matters as the sharing of costs and revenues, establishment of charges for use of the INTELSAT satellites, and procurement policies and procedures. It also spells out the procedures governing acquisition, protection, and sharing of rights in inventions and technical data arising from research and development work financed by INTELSAT — an area of immense importance to the advancement of technology involving as it does a delicate balance between adequate incen-

tives for innovation, on one hand, and the need for the freest possible exchange of information, on the other.

Perhaps you have been wondering why the governing body of INTELSAT is called the *Interim* Communications Satellite Committee. This title reflects the interim character of the arrangements which were negotiated in 1964. Given the rapidity with which space communications technology was developing, and recognizing the impossibility of foreseeing all of the factors which ought to be taken into account in establishing long term arrangements in such a swiftly evolving field of technology, it was thought best to establish a set of international arrangements which would be renegotiated in approximately 5 years. The intergovernmental agreement accordingly provides that not later than January 1, 1969, the Interim Communications Satellite Committee shall render a report containing recommendations concerning the definitive arrangements for an international global system which shall supersede the present interim arrangements. Within 3 months following submission of the Committee's report, the United States Government must convene an international conference for the purpose of considering the report. Although the present agreement provides that every effort shall be made to bring the definitive arrangements into force by January 1, 1970, the interim arrangements remain in effect until the entry into force of the definitive arrangements. Complete continuity is thus contemplated in the transition from the interim to the definitive arrangements.

It is hardly necessary to stress the uniqueness and unprecedented nature of the INTELSAT arrangements. However, in assessing the response which the architects of international law and organization have made to the challenge of space communications technology, certain fundamental concepts underlying the arrangements deserve some emphasis:

> First: The concept of an international cooperative enterprise, with very widespread membership, for the purpose of sharing the exploitation of a new resource, from the very outset of its commercial development, for the benefit of all mankind;
> Second: The effort to reduce national rivalries in a new field of economic activity by the concept of a single global system rather than competing national and regional systems;
> Third: A form of organization which recognizes the diversity of national economic systems by permitting participation of either public or private entities on behalf of the signatory countries;

Fourth: A form of organization which provides for a wide disparity of investment and ownership reflecting the probable extent of use of the global system by the various participants, and which takes this factor into account in the decisionmaking process.

The form of organization established by the INTELSAT agreements has met the pragmatic test. It is a going concern, engaged in a successful commercial enterprise of worldwide dimensions. Although the present INTELSAT satellites are but the first small steps in the application of space technology to commercial uses, they already provide an enormous augmentation of our international telecommunications facilities. In fact, their total capacity for high quality voice communications over transoceanic distances approximates that of all the existing transoceanic submarine cables; and, in addition, they have provided the first opportunity for international television on a regular basis.

The rapidly increasing capacity of each successive generation of satellites, coupled with longer useful orbital lifetimes, means lower costs to the users of telecommunications services in all areas served by the global system. This will be the inevitable result of the gigantic expansion of available facilities for telephone, telegraph, and data transmission as the much larger satellites of the future come into service.

With the global INTELSAT system in being, an investment of $3 to $5 million in an earth station is all that is required to provide even the most isolated country with a window to the whole world. A country with an earth station having access to a satellite system of global coverage is immediately linked to virtually every other country similarly equipped. It now appears that at least 40 earth stations serving at least 50 countries in every continent of the world will be using the INTELSAT satellites by the end of 1969. Most of these will be in the developing countries.

Spectacular as the success of the first INTELSAT satellites has been, they will undoubtedly be regarded in a few years as primitive devices which served mainly to point the way to revolutionary changes in global communications which can hardly be imagined at the present time. Lest anyone think that space communications technology will not continue to present challenges to the law comparable to those of the past decade, let me mention just one possibility.

Perhaps the most revolutionary change promised by communi-

cations satellites during the next decade or so will come about when direct broadcasting from satellites into the home receiver is realized. While radio is today the only means of surmounting the barriers which certain societies have erected to control the flow of information to their people from the outside world, direct television broadcasting from satellites promises to add the powerful impact of the visual image to the appeal of the spoken word. Language differences which have limited the effectiveness of radio will be much less significant in the era of direct television broadcasting.

The satellites which will be employed in the early phases of the global system will not have this capability, but it is a possible development in the decade of the 1970's. During the early phases of the system, television programs carried by satellite will have to be rebroadcast from stations on the ground to the home receiver, and thus they pose no radically new problems of national or international control. With the advent of direct broadcasting of television from satellites, a totally new situation will arise which will test the ingenuity and creativity of the lawyers and statesmen of the future. This situation will present in an acute form the conflicting claims of the desire for freedom of information — the freedom to see and hear — on the one hand, and the desire of organized societies to impose some degree of control over the dissemination of spoken and visual material to their own people, on the other.

Technology today has an internal dynamism of its own which strains against confinement within national boundaries. The challenges it holds for the law and lawyers lie more and more in the transnational field. This is a field in which litigation and adjudication are not the principal manifestations of the law and of the lawyer's skills. Rather, it is in the work of negotiation and legislation — not legislation by the decree of a permanently constituted assembly or council, but legislation by means of multilateral agreements which carry within themselves adequate incentives of voluntary self-interest — where the law and the lawyer may find their greatest opportunity and their greatest usefulness in the years that lie immediately ahead.

Looking back over the past decade, we see that each step in the development of satellite communications was preceded or accompanied by a development of at least equal significance in the legal field. The earliest experimental communications satellites were preceded by enactment of the National Aeronautics and Space Act of 1958; Telstar was made possible by a unique contractual ar-

rangement between government and industry. Early Bird, and the later INTELSAT satellites leading to the establishment of a global system, followed the enactment of the Communications Satellite Act of 1962, the organization of COMSAT, and the establishment of a multi-nation consortium, INTELSAT.

Perhaps this case history of the interrelationship of law and technology in the particular area of space communications will help to make the point I mentioned earlier — a point that goes a bit beyond the stated subject of this symposium. The role of law is not merely to respond to the challenges of new technology. Rather, by providing in a timely manner the framework for enlarged opportunities for practical achievement, the law should challenge technology itself to the most rapid possible advancement.